WO1999050795

Publication Title:

COIN DISPENSING

Abstract:

Abstract of WO 9950795

(A1) Translate this text A coin dispensing mechanism for dispensing coins from a circular cluster of coin tubes (14), comprising a driver ring (22) and a coaxial selector disc (24), the surfaces of the two rings being in the same plane, the two rings being movable into a position where the apertures in each are aligned to receive a coin, and to move the coin to a dispense aperture (32).

PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : G07D 1/00	A1	(11) International Publication Number: WO 99/50795
		(43) International Publication Date: 7 October 1999 (07.10.99)

(21) International Application Number: PCT/GB99/00805

(22) International Filing Date: 17 March 1999 (17.03.99)

(30) Priority Data:
9806667.3 27 March 1998 (27.03.98) GB

(71) Applicant *(for all designated States except US)*: MARS, INCORPORATED [US/US]; 6885 Elm Street, McLean, VA 22101–3883 (US).

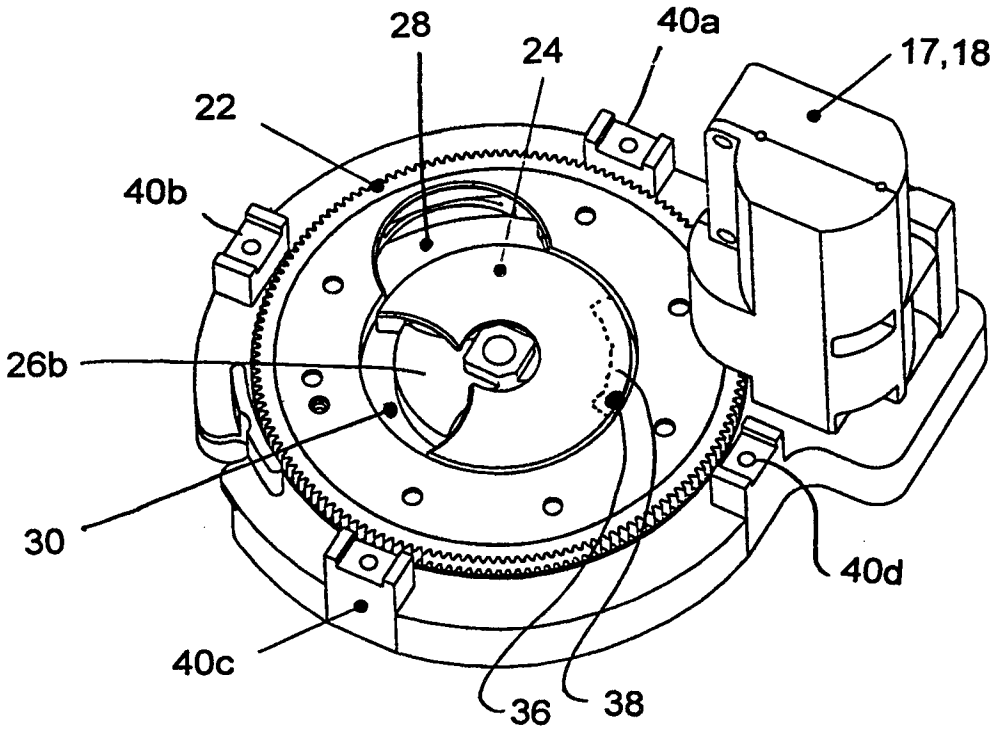
(72) Inventor; and
(75) Inventor/Applicant *(for US only)*: AURELIUS, Karen [GB/GB]; 14 The Lilacs, Barkham, Nr. Wokingham, Berkshire RG41 4UT (GB).

(74) Agents: MUSKER, David, Charles et al.; R.G.C. Jenkins & Co., 26 Caxton Street, London SW1H 0RJ (GB).

(81) Designated States: AU, CA, JP, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: COIN DISPENSING



(57) Abstract

A coin dispensing mechanism for dispensing coins from a circular cluster of coin tubes (14), comprising a driver ring (22) and a coaxial selector disc (24), the surfaces of the two rings being in the same plane, the two rings being movable into a position where the apertures in each are aligned to receive a coin, and to move the coin to a dispense aperture (32).

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	**ES**	Spain	**LS**	Lesotho	**SI**	Slovenia
AM	Armenia	**FI**	Finland	**LT**	Lithuania	**SK**	Slovakia
AT	Austria	**FR**	France	**LU**	Luxembourg	**SN**	Senegal
AU	Australia	**GA**	Gabon	**LV**	Latvia	**SZ**	Swaziland
AZ	Azerbaijan	**GB**	United Kingdom	**MC**	Monaco	**TD**	Chad
BA	Bosnia and Herzegovina	**GE**	Georgia	**MD**	Republic of Moldova	**TG**	Togo
BB	Barbados	**GH**	Ghana	**MG**	Madagascar	**TJ**	Tajikistan
BE	Belgium	**GN**	Guinea	**MK**	The former Yugoslav Republic of Macedonia	**TM**	Turkmenistan
BF	Burkina Faso	**GR**	Greece			**TR**	Turkey
BG	Bulgaria	**HU**	Hungary	**ML**	Mali	**TT**	Trinidad and Tobago
BJ	Benin	**IE**	Ireland	**MN**	Mongolia	**UA**	Ukraine
BR	Brazil	**IL**	Israel	**MR**	Mauritania	**UG**	Uganda
BY	Belarus	**IS**	Iceland	**MW**	Malawi	**US**	United States of America
CA	Canada	**IT**	Italy	**MX**	Mexico	**UZ**	Uzbekistan
CF	Central African Republic	**JP**	Japan	**NE**	Niger	**VN**	Viet Nam
CG	Congo	**KE**	Kenya	**NL**	Netherlands	**YU**	Yugoslavia
CH	Switzerland	**KG**	Kyrgyzstan	**NO**	Norway	**ZW**	Zimbabwe
CI	Côte d'Ivoire	**KP**	Democratic People's Republic of Korea	**NZ**	New Zealand		
CM	Cameroon			**PL**	Poland		
CN	China	**KR**	Republic of Korea	**PT**	Portugal		
CU	Cuba	**KZ**	Kazakstan	**RO**	Romania		
CZ	Czech Republic	**LC**	Saint Lucia	**RU**	Russian Federation		
DE	Germany	**LI**	Liechtenstein	**SD**	Sudan		
DK	Denmark	**LK**	Sri Lanka	**SE**	Sweden		
EE	Estonia	**LR**	Liberia	**SG**	Singapore		

COIN DISPENSING

This invention relates to apparatus for dispensing coins, and to a coin store incorporating such apparatus.

One use for a coin store of this type is in change giving apparatus, in which coins are accepted and change is dispensed. The uses for such apparatus include vending machines, pay phones, ticket machines and so on.

Coin stores include hoppers, in which a number of coins are stored for payout, and coin tubes, in each of which a single (different) denomination of coins is stored for use.

One example of a dispensing mechanism for use with a hopper is shown in US 4997405. This mechanism comprises a pair of plates rotated at different speeds, each plate having a circular aperture. When the apertures are aligned beneath the hopper, a coin can pass through both and is dispensed.

In coin changers such as the Cashflow Model 560, available from Mars Electronics International, Eskdale Road, Winnersh Triangle, Wokingham, Berkshire, UK, each coin tube is provided with a separate dispense member (a rotated sweep arm), actuated by a motor. Since the dispense members (and motors) occupy considerable space, coin tubes must be positioned in a line next to each other, which reduces the number of coin tubes which can be provided within the change mechanism.

Examples of alternative coin dispensing mechanisms for coin tubes are shown in US5595535 and US5330384.

In one aspect, the invention provides a coin dispensing mechanism which is relatively compact and economical in its use of components. In this aspect, the present invention provides a coin dispensing mechanism for dispensing from a coin tube, comprising first and second movable members, each having an aperture, each being alignable with a coin tube, the apertures being alignable with each other, the first and second members being movable into a position in which the apertures are not aligned, the first and second members having an upper surface for coin support, and the upper surfaces being substantially co-planar.

Accordingly, a common dispense member may dispense from plural tubes, the second movable member co-operating with the first to enable the mechanism to pass from one tube under another without jamming.

Provision of a compact dispensing mechanism of this type enables the coin tubes to be compactly aligned, for example to be radially disposed in a circular arrangement. Accordingly, in another aspect, the present invention provides a coin store unit comprising at least three coin tubes arranged around the periphery of a circle, and a common dispenser mechanism comprising at least one rotary element , rotatable into alignment with any of the tubes, for dispensing coins from any of said tubes to one or more outlets.

Embodiments of the invention will now be illustrated, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 shows a conventional vending machine (not to scale) including a coin store according to the prior art;

Figure 2 is a block diagram showing the electrical components of the dispenser according to a first embodiment of the invention;

Figure 3 is a flow diagram showing the operation of a control unit according to the first embodiment;

Figure 4 is a perspective view of a coin store unit comprising a coin store and a dispenser mechanism according to the first embodiment;

Figure 5 corresponds to Figure 4 but with the removal of the coin store;

Figure 6 corresponds to Figure 5 but with the removal of the drive ring;

Figure 7 corresponds to Figure 6 but with the removal of the selector disc;

Figure 8 is an exploded perspective view showing the assembly of the components of Figures 4 to 7;

Figures 9a to 9f are partial perspective views, with the upper portions of the coin tubes removed, showing the relative positions of the selector disc and drive ring during operation of the first embodiment;

Figure 10 is a schematic partial cross-section illustrating the spacings of the components to accommodate coin thicknesses;

Figure 11 is a schematic partial cross-section illustrating the corresponding spacings in a fourth embodiment to accommodate multiple coin denominations of substantially different thicknesses; and

Figure 12 is a partial sectional perspective view of the fourth embodiment.

Vending Machine

Referring to Figure 1, a conventional vending machine comprises a machine body 1 comprising a vending control circuit 2, an article store 3, which stores the articles to be sold by the vending machine, 4, which dispenses a selected article from the article store 3 and supplies it to an article outlet opening 5.

Provided within the vending machine body 1 is a coin change giving mechanism 10 comprising a coin inlet 11 accepting a coin, a coin path carrying the coin past coin validator electronics 12, and a selector mechanism 13 directing the coin to one of a plurality of coin tubes 14a, 14b, 14c, 14d making up a coin store 14.

In use, the user inserts coins into the vending machine and the coin mechanism recognises the coins and directs them to the appropriate tubes. On selection of an article for vending, the vending control circuit 2 determines the appropriate amount of change to be dispensed, and signals this to the coin

mechanism processor 16, which then actuates the coin dispensing mechanism 15 to dispense the appropriate coins from the coin store 14 to the coin return outlet 6.

First Embodiment

In the first embodiment, the vending machine is substantially as described above, as are the validation components 11. Accordingly, these components will not be described further.

Referring now to Figure 2, the present invention comprises a motor 18 and a position sensor circuit 19, connected to the coin control processor 16. Associated with the motor 18 is a motor drive circuit (not shown) of conventional form.

Referring to Figure 4, the coin store 14 of the present embodiments comprises a circular cluster of four coin tubes 14a, 14b, 14c, 14d. Beneath the coin tubes is the dispense mechanism 15, to which is connected a gearbox 17 driven by the motor 18 (not shown).

Coin store 14 is secured to the dispenser 15 by four radially spaced mounting arms 42a, 42b, 42c, 42d, received in corresponding mounting slots 40a, 40b, 40c, 40d provided on the dispenser mechanism 15.

Referring now to Figure 5, in which the coin store 14 has been removed, the dispenser mechanism 15 comprises a driven ring 22, with a toothed edge which engages with the teeth of the gearbox 17, and a selector disc 24 disposed within, and coplanar with, the drive ring 22. Drive ring 22

carries a peg 36 projecting radially inward, which engages with the slot 38 in the selector disc 24.

Referring to Figure 6, the selector disc 24 overlies an inner coin support surface 26b separated from coin support surface 26a by a slot 34 within which the selector disc 24 is arranged to run. The inner and outer coin support surfaces 26a, 26b are solid with a plate 25 which carries tube assembly mounting slots 40a - 40d and a pair of pillars 45a, 45b (not shown in Figure 6 - see Figure 9) arranged to mount the gearbox 17 and motor 18.

Provided within the drive ring 22 is an aperture 28, comprising a circle having a diameter corresponding to that of the largest coin to be dispensed from the store 14. A pair of diametrically opposite, similarly sized apertures 32a, 32b are provided in the support surface 26.

The selector disc 24 is partially interrupted by an aperture 30, which conforms to the drive ring aperture and the support surface apertures 32.

The selector disc 24 has an L - shaped cross section. The outer part rides around the outer wall of the inner coin support surface 26b and the lower edge bears upon the plate 25. The upper surface of the selector disc 24 is arranged to lie at the same level as the upper surface of the drive ring aperture 28, so that when the selector disc obstructs the drive ring aperture 28, the two present a continuous plate to support the coin. The outer part rides around the outer wall of the outer coin support surface 26a and the lower edge bears upon the plate 25.

The radial extent of the slot 38 corresponds to the radial extent of the aperture 30 in the selector disc 24. Thus, there is some play rotationally between the selector disc and the drive ring, such that the selector disc can rotate to a position where the apertures 30 and 28 are aligned to receive a coin, and to a position in which the apertures are not aligned, with the selector disc 24 obstructing the aperture 28 in the drive ring 22.

The depth of the support surfaces (which lie at the same level) below the upper surfaces of the selector disc 24 and drive ring 22 are related to the depth of the coin to be dispensed and are thinner than the thickness of a coin to be dispensed. Thus, once the coin has dropped into the apertures 28, 30 it will lie flush with, or proud of, the selector disc 24 and the drive ring 22 and be supported on the coin support surfaces 26a, 26b.

The dispensing apertures 32a, 32b are positioned so as not to be aligned with any of the coin tubes 14a, 14b, 14c, 14d. Thus, it is not possible for a coin to drop straight out of one of the tubes 14 to the dispense apertures, regardless of the position of the selector disc 24 and drive ring 22.

Referring to Figure 9, the operation of this embodiment will now be described.

In the initial or "home" position of Figure 9a, the drive ring 22 is positioned so as to be out of alignment with coin tubes 14, but aligned with one of the apertures 32. The selector disc 24 is out of alignment with the drive

ring 22, because of the play of the peg 36 in the slot 38. In this position, coins are resting on the surfaces of the drive ring and the selector disc.

When it is desired to dispense a coin from the tube 14a, the drive ring is driven clockwise. The peg 36 is at the leftmost end of the slot 38, and therefore engages with the end of the slot, so that the selector disc 24 is also driven clockwise and remains out of alignment with the drive ring 22.

The drive ring 22 continues to be driven until it has passed 90 degrees past the selected coin tube (tube 14a). In this position, as shown in Figure 9b, the selector disc 24 has been driven into alignment with coin tube 14a, although the drive ring 22 is not in alignment with the coin tube 14a.

Next, referring to Figure 9c, the direction of travel of the drive ring 22 is reversed and it is driven anti- clockwise by 90 degrees. The pin 36 now travels within the slot 38 in the selector disc 24, so that the selector disc 24 does not move with the drive ring but instead remains in its rotational position of Figure 9b under the weight of the coins in the coin tubes 14. The drive ring 22 is therefore brought into alignment with the coin tube 14a as shown in Figure 9c, so that the two apertures 28 and 30 are aligned beneath the coin tubes, allowing the coin to drop from the coin tube onto the support surfaces 26a, 26b beneath the selector disc and drive ring.

Drive ring 22 continues to be driven in the same direction. The right hand edge (in Figure 9c) of the selector disc 24 and the drive ring 32 engages the coin, and so the selector disc 24 is also driven by the drive ring 22 due to

the pin 36 reaching the end of the slot 38. Thus, the aligned apertures, including the coin beneath them, continue to rotate anti clockwise until the aperture 32a is reached, through which the coin falls to be dispensed. Because the aperture 32a is not aligned with any coin tube 14, no further coins can fall.

Ideally, in this embodiment, the depth of the support surface 26 below the top surface of the selector disc 24 and drive ring 22 would be exactly the thickness of a coin, and the tubes 14 would descend to the level of the upper surfaces of the selector disc and drive ring. However, since coin thicknesses of coins of the same denomination vary in practice, some tolerance must be provided.

Referring to Figure 10, the depth of the support surface 26 (set by the thickness of the selector and drive rings) below the top surface of the selector disc 24 and drive ring 22 therefore is equal or less than the minimum thickness (Tmin) of a coin to be stored in the store, so that average or thick coins will stand somewhat proud of the surface.

The spacing between the support surface 26 and the bottom of the tubes 14 exceeds the maximum thickness (Tmax) of the coins to be stored, so that no coin can, whilst sitting on the support surface, also lie within the tube 14 and jam the mechanism.

It must also be less than twice the minimum thickness Tmin, so that a coin falling onto the support surface 26 cannot be followed out of the tube 14 by another.

Also, the spacing from the upper surface of the drive and selector rings 22, 24 to the bottom of the tube 14 must be less than the minimum coin thickness (Tmin), to prevent coins falling out beneath the tubes 14 onto the rings.

Finally, the spacing between the selector disc and drive ring, and the support surface, must be narrower than the minimum coin thickness Tmin, so that no coin can be trapped and jam between the two.

The upper surfaces of the selector disc 24 and drive ring 22 must be coplanar to within substantially less than the thickness of the thinnest coin to be stored if jams are to be avoided.

In this embodiment, for each coin dispensing operation, the drive ring is driven clockwise to get to the desired coin tube 14, and then returned anti clockwise to align the drive ring 22 and then to bring the coin within the apertures to the dispense aperture position. Although in the operation described above, the selected coin tube 14a was adjacent to a dispense aperture 32, it will be understood that the invention operates correctly even where the drive ring 22 and selector disc 24 are rotating underneath one or more further coin tubes before reaching the dispense apertures 32, since the coin lying within the apertures blocks the entry of further coins from further coin tubes into the aligned apertures prior to reaching the dispense aperture 32.

Referring to Figure 3, the process performed by the coin validator control circuit 16 will now be discussed. In a step 102 a signal is received from the vending machine control unit 2, indicating the price of the goods dispensed.

In a step 104 the processor unit 16 calculates the coins to be dispensed to make up the correct change, using a change algorithm as described in our earlier patents GB2269258 or GB2284090. In a step 106, the control unit reads the position sensed by the position sensor 19, to detect the position of the drive ring 22.

In a step 108, a first of said coins is selected for dispensing. In a step 110, the control unit 16 energises the motor 18 to drive the drive ring 22 clockwise, to a position 90 degrees beyond the coin tube corresponding to the denomination selected for dispensing.

In a step 112, the control unit 16 rotates the motor 18 anti clockwise to dispense a coin through the dispense outlet.

In a step 114, the control unit 16 determines whether the coin was the last coin to be dispensed, and if so, halts the change giving operation. If not, in a step 116, the control unit 16 resumes at step 106.

The motor 18 rotates at a constant speed, so that the amount of rotation is controlled by controlling the time of operation of the motor 18 and its direction of rotation.

The position sensor 19 may be an optical sensor, which detects the occurrence of predetermined features (holes) on the drive ring 22 and generates a corresponding pulse for detection by the control circuit 16. By detecting the direction of rotation and counting the pulses, the control circuit 16 is aware of the drive ring 22 at any time.

Second Embodiment

In the above described embodiment, the direction of rotation to select a coin is always clockwise. However, in this embodiment, the processor 16 is arranged to select the order of coins in step 116 such that, where possible, selection of coins may be made in the anti clockwise direction.

If, having dispensed a coin in the position shown in Figure 9b, the next coin to be dispensed lies in the coin tube 14 b which lies immediately beyond the dispense aperture 32, the processor may control the motor 18 to continue rotating anti clockwise until the apertures in the drive ring 22 and a selector disc 24 are aligned with the bottom of the coin tube 14b.

Thus, the processor 16 attempts to locate a sequence of coins which will lie on immediately opposite sides of the dispense apertures 32, so that it is not always necessary to reverse the direction of travel of the motor during each dispense operation. This reduces the time required for each dispense operation and therefore increases the payout speed.

Third Embodiment

In the third embodiment, all four tubes carry the same denomination of coins. The cluster of coin tubes therefore acts as a hopper. In this case, dispensing may proceed continuously anti clockwise.

Fourth Embodiment

In the above described embodiments, no difficulties are encountered where the coins in the different tubes have substantially similar thicknesses. However, where the thicknesses of coins in different tubes do differ substantially, difficulties may arise because where a thin coin has been selected and lies within the aligned apertures in the drive ring and selector disc, it will lie some way below the surface of the disc and ring 22, 24 (since the depth of the aperture is set by the support surface 26 and hence by the thickest possible coin), and so it would be possible for a second coin from the same tube to fall into the apertures and block the mechanism. Further, when the rings are driven under another coin tube, it would be possible for the lower most part of the coin from that tube to enter into the selector aperture and jam the mechanism.

In this embodiment, this difficulty is overcome by providing that the coin support surface has different thicknesses underlying the different coin tubes. The depth of the coin support surface 26 below the surfaces of the selector disc 24 and drive ring 22 corresponds to the thickness of the coin stored in the tube 14 which overlies that portion of the surface; thus, the

support surface underlying a tube full of thin coins is higher than the support surface underlying a tube full of thick coins.

Figure 11 illustrates one aspect of this embodiment of the invention. It will be seen that the heights of the support surfaces vary, with the support surface on one half of the mechanism being lower than that on the other half of the mechanism. The support surface 26, which is passed over by the drive ring as it rotates in the dispense operation anti clockwise towards the dispense aperture 32b, is lower, to accommodate a thicker coins in the two overlying coin tubes 14, whereas the support surface 27 is higher to accommodate thinner coins in the two overlying coin tubes.

Thus the arrangement of Figure 11 is capable of providing two denominations of coin, each in two coin tubes.

Figure 12 illustrates a further arrangement according to this embodiment of the invention. In the arrangement of Figure 12, the height of the coin support surfaces 261a,b; 262a,b; 263a,b; 264a,b differs under each of the coin tubes 14a-14d so as to correspond to the depth of coins in each of the coin tubes. Thus, four different denominations of coin can be provided, with substantially different thicknesses.

In this embodiment, as in the second embodiment, the apparatus can dispense either clockwise or anticlockwise. Each tube is dispensed to the orifice 32a, 32b closest to the tube, so that it is unnecessary for a captive coin to pass under any other coin tube to be dispensed.

Other Embodiments

It will be apparent that the invention is not limited to the foregoing embodiments, but may be varied in many respects. For example, although it is preferred to provide a circular cluster of coin tubes, it would equally be possible to provide a similar dispensing mechanism for a linear array of coins, and in which the drive and selector discs are replaced by linearly moving plates. Accordingly, such arrangements are not excluded from the scope of the invention.

It may be convenient to provide the coin support surfaces as insertable (for example snap-fit) separate components, to allow customisation for different coin thicknesses.

Although a linkage with play or lost motion between the drive ring and selector disc is disclosed above, they could be separately driven, or connected together in some other way.

Furthermore, it will be understood that the invention could be utilised not only for coins but for other articles of value such as tokens, or possibly for other similar articles to be dispensed.

Clearly, groups of the disclosed tube clusters could be co-located, and (for the hopper embodiment) driven from a common motor.

All these variations, together with any other modifications which would be apparent to the skilled reader, are to be considered within the scope of the present invention.

CLAIMS

1. A coin dispensing mechanism for dispensing from a coin tube, comprising first and second movable members, each having an aperture, each being alignable with a coin tube, the apertures being alignable with each other, the first and second members being movable into a position in which the apertures are not aligned, the first and second members having an upper surface for coin support, and the upper surfaces being substantially co-planar.

2. A mechanism according to claim 1, in which the first and second movable members are alignable with a plurality of different coin tubes.

3. A mechanism according to claim 2, in which the plurality of different coin tubes are radially arranged, and in which the first and second members are arranged to rotate into alignment with each.

4. A mechanism according to claim 3, in which the second member comprises a ring driven at its periphery.

5. A mechanism according to any preceding claim, in which there is provided an outlet aperture, displaced from the coin tube, and in which the

first and second members are movable into a position in which the apertures are aligned with the outlet aperture.

6. A mechanism according to any preceding claim, in which the first and second members are coupled together by a coupling permitting sliding motion of a limited extent between the members, to permit them to move between positions where their apertures are aligned and misaligned.

7. A mechanism according to claim 6, in which the coupling comprises a peg provided on one of said members engaging with a slot provided on the other.

8. A mechanism according to any preceding claim, comprising a motor arranged to drive the mechanism so as to move the first and second members in either first direction or a second, opposed, direction; and control means for controlling the motor to move the mechanism in both said directions sequentially during a single dispense operation.

9. A mechanism according to any preceding claim, further comprising a support surface provided beneath the first and second members, at a depth beneath the surface thereof which is related to the depth of a coin to be dispensed.

10. A mechanism according to claim 9, when appended to claim 2, in which said support surface is provided with a plurality of portions of different depths, aligned with different said coin tubes, corresponding to the depths of coins stored therein.

11. A mechanism according to any preceding claim, further comprising at least one coin tube fastened to said mechanism to provide a coin store unit.

12. A coin store unit comprising at least three coin tubes arranged around the periphery of a circle, and a common dispenser mechanism comprising at least one rotary element , rotatable into alignment with any of the tubes, for dispensing coins from any of said tubes to one or more outlets.

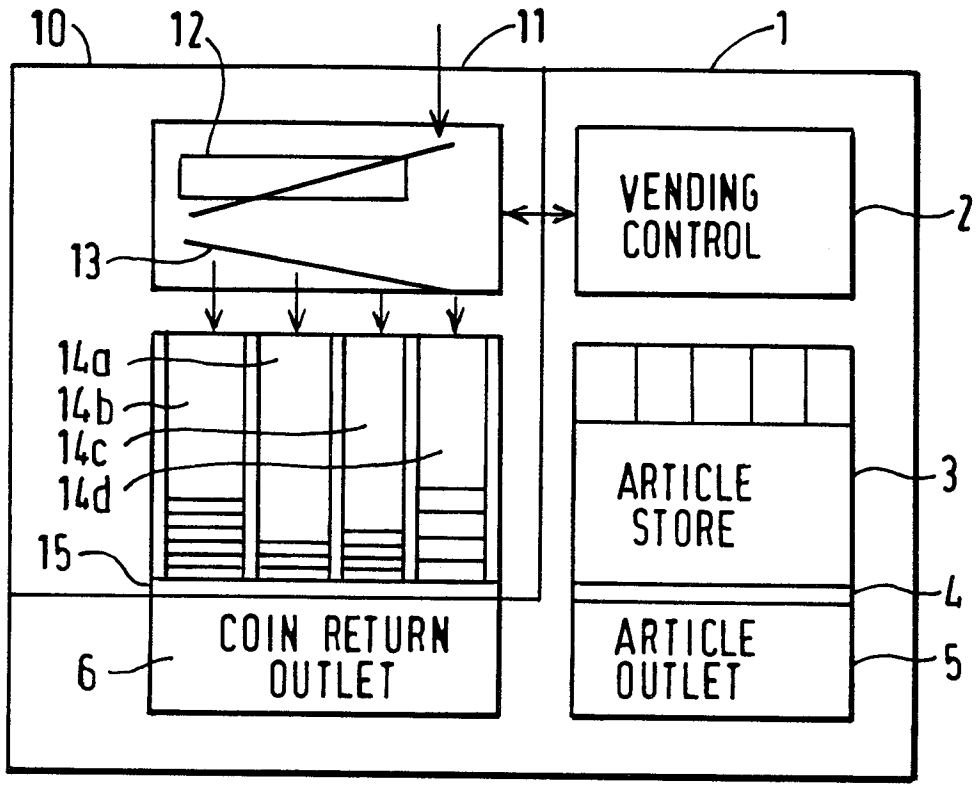

10
12
11
1
VENDING CONTROL
2
13
14a
14b
14c
14d
15
ARTICLE STORE
3
4
COIN RETURN OUTLET
6
ARTICLE OUTLET
5

FIG. 1

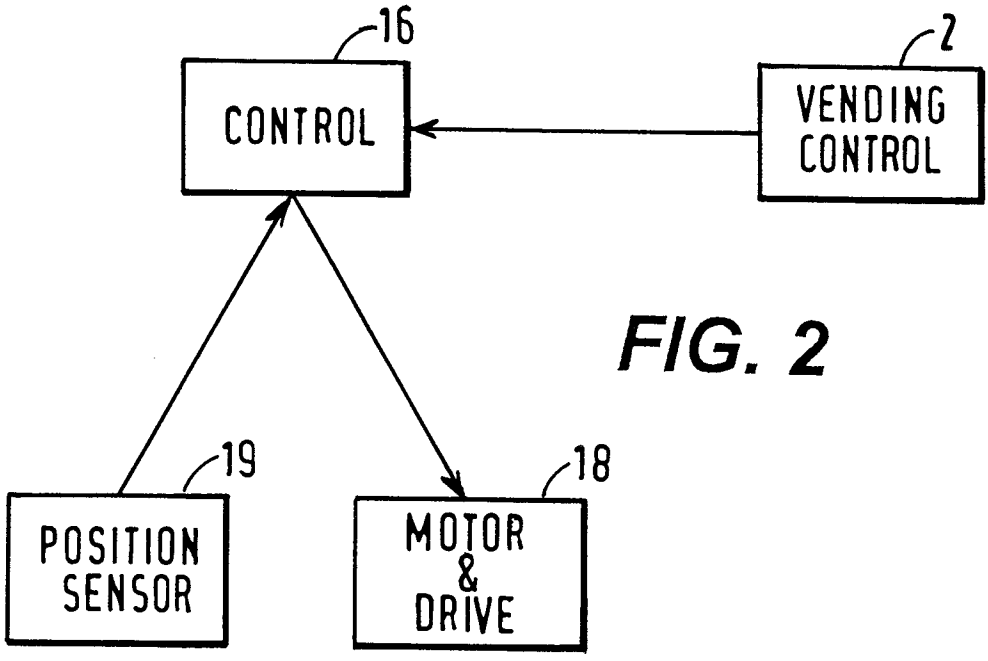

16
CONTROL
2
VENDING CONTROL
19
POSITION SENSOR
18
MOTOR & DRIVE

FIG. 2

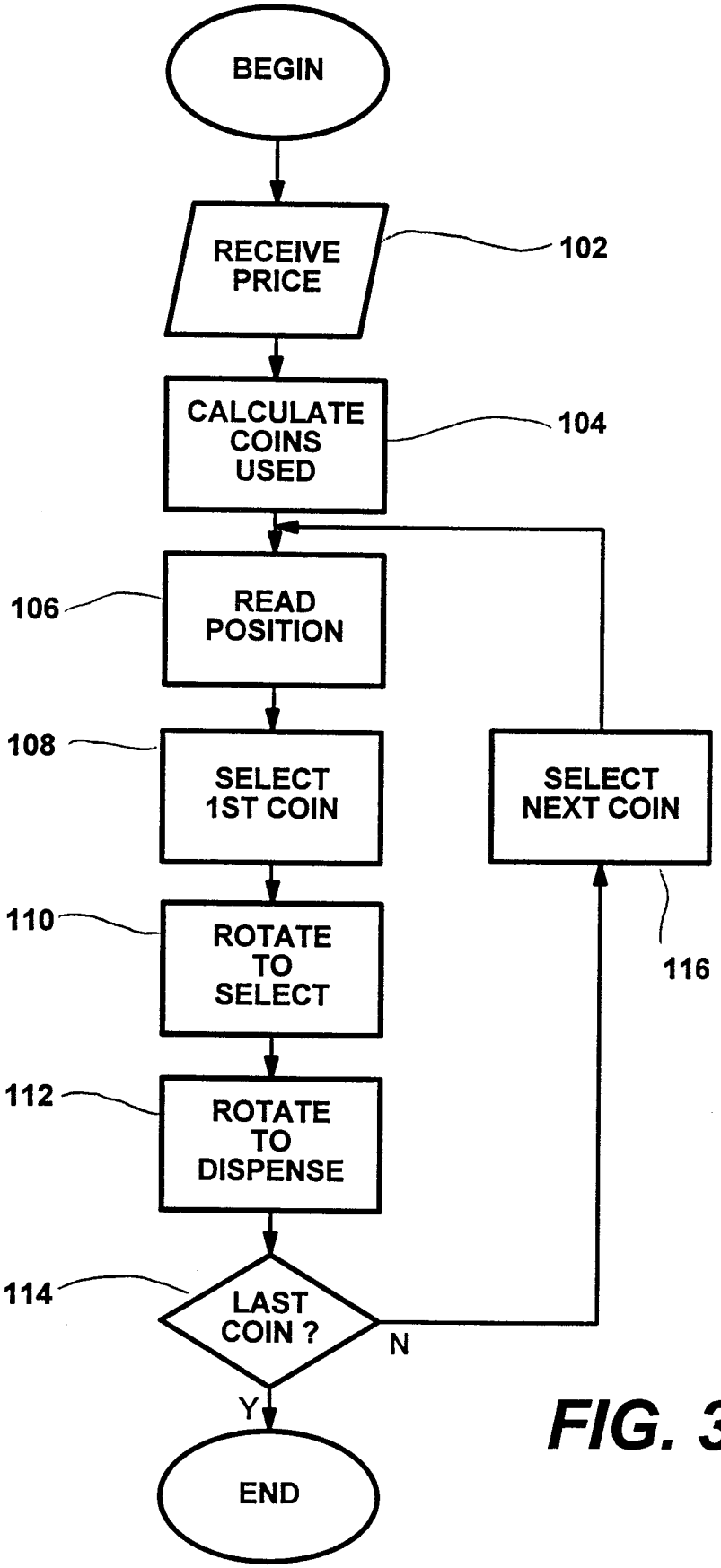

BEGIN
RECEIVE PRICE
102
CALCULATE COINS USED
104
106
READ POSITION
108
SELECT 1ST COIN
110
ROTATE TO SELECT
112
ROTATE TO DISPENSE
114
LAST COIN ?
N
Y
END
SELECT NEXT COIN
116

FIG. 3

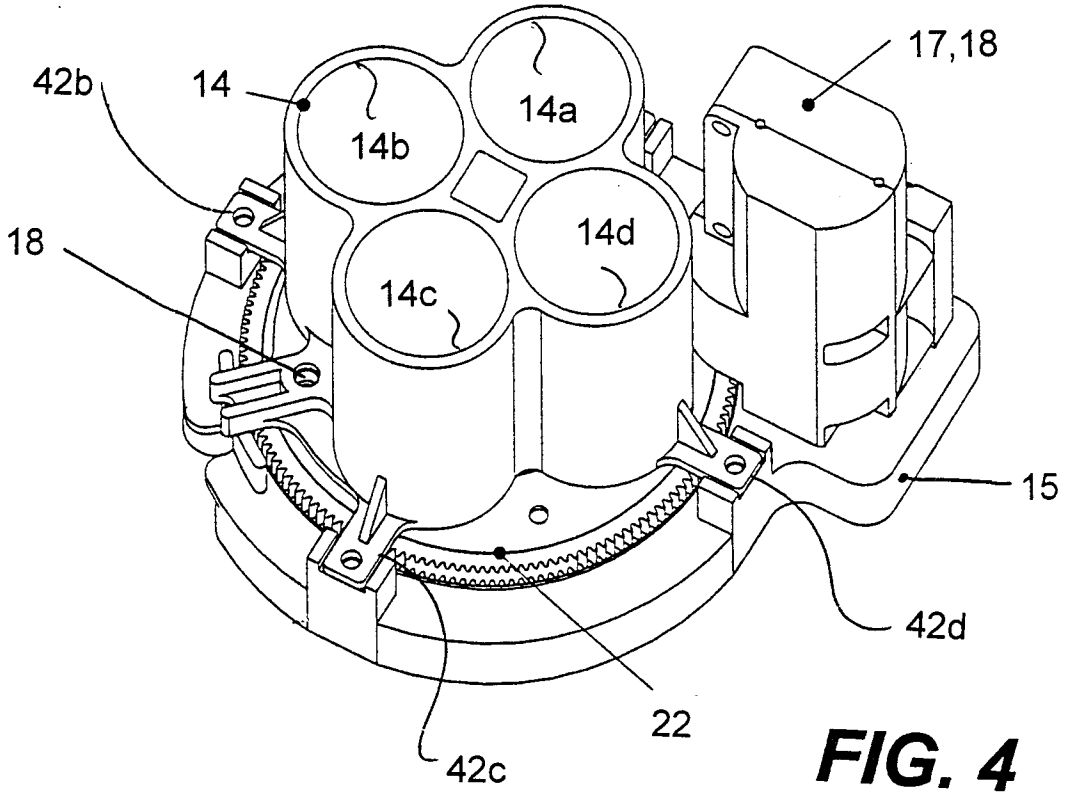

42b
14
14a
14b
17,18
18
14d
14c
15
42d
22
42c

FIG. 4

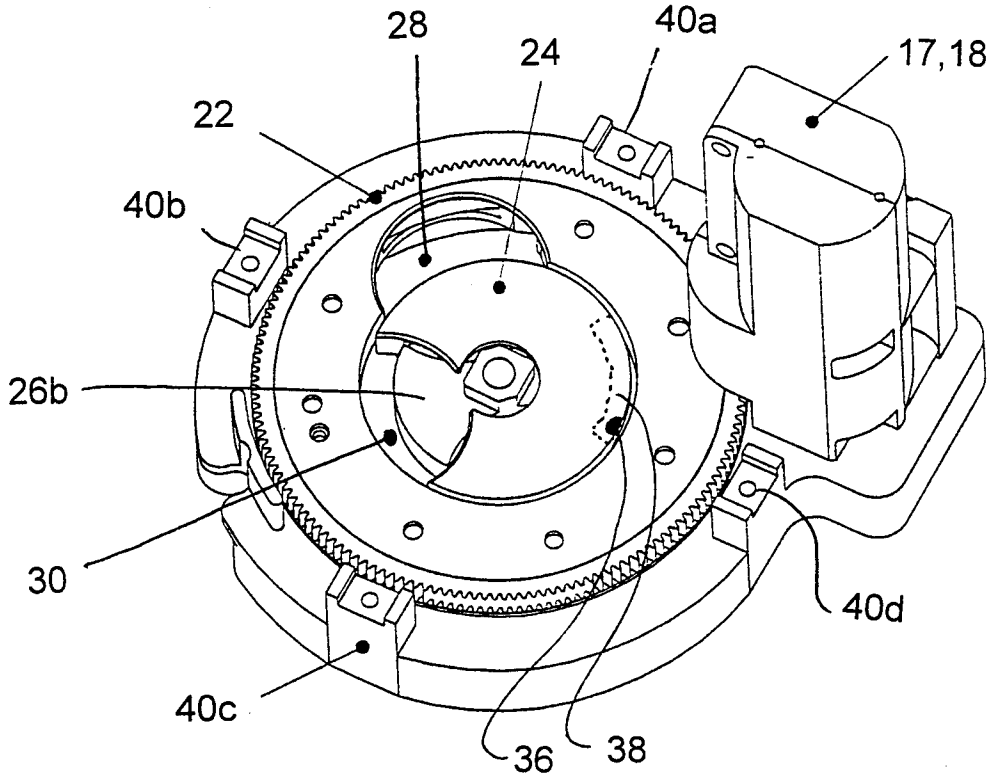

28
24
40a
17,18
22
40b
26b
30
40d
40c
36
38

FIG. 5

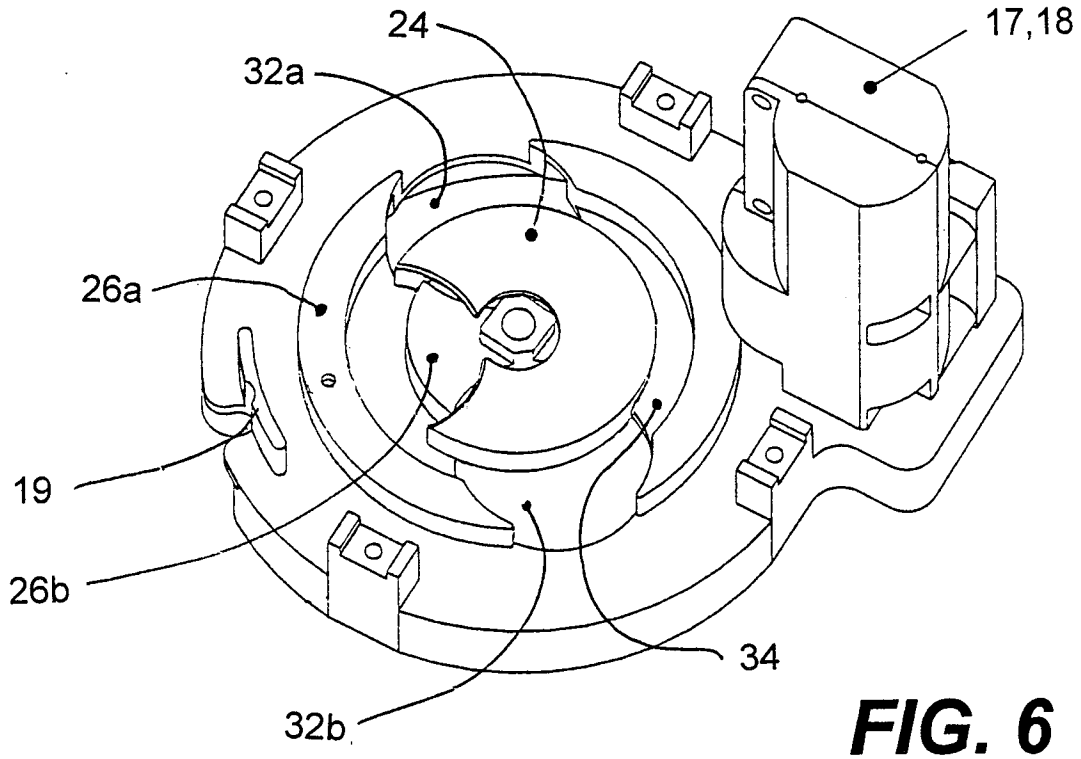


FIG. 6

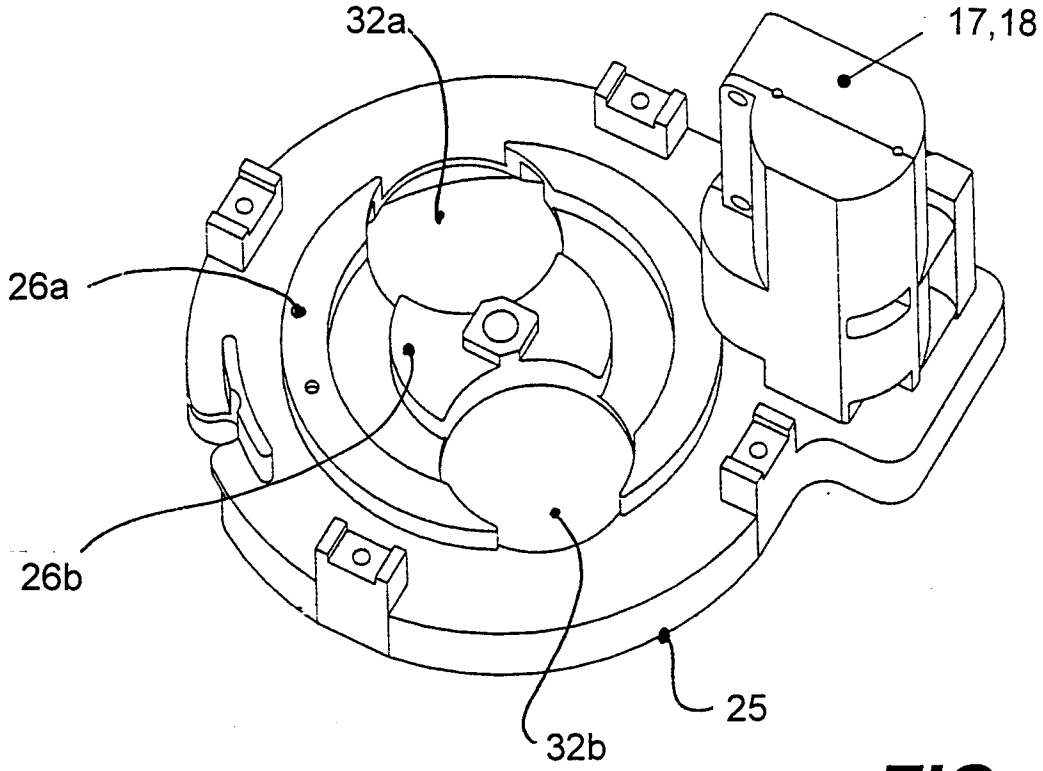


FIG. 7

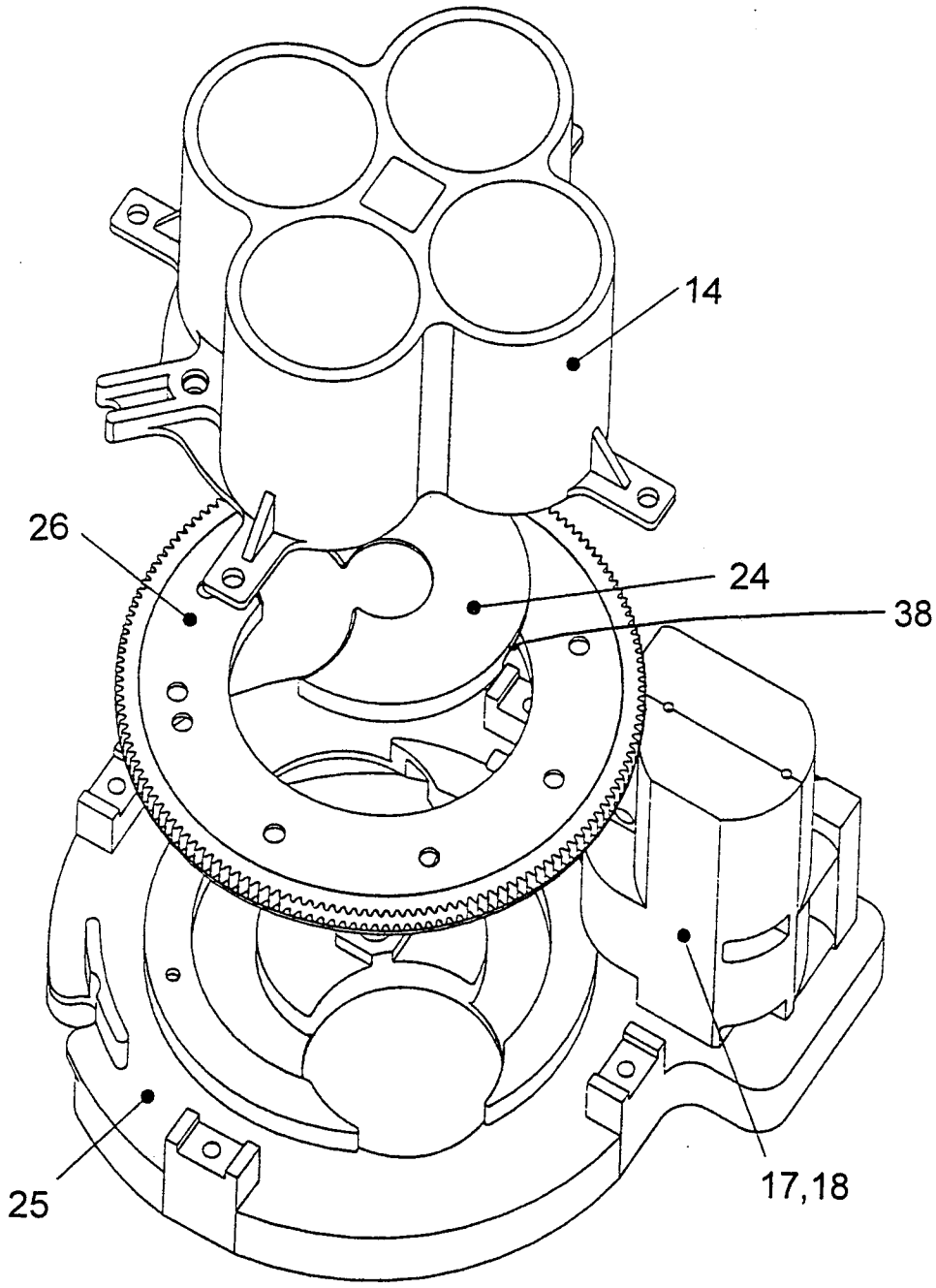


FIG. 8

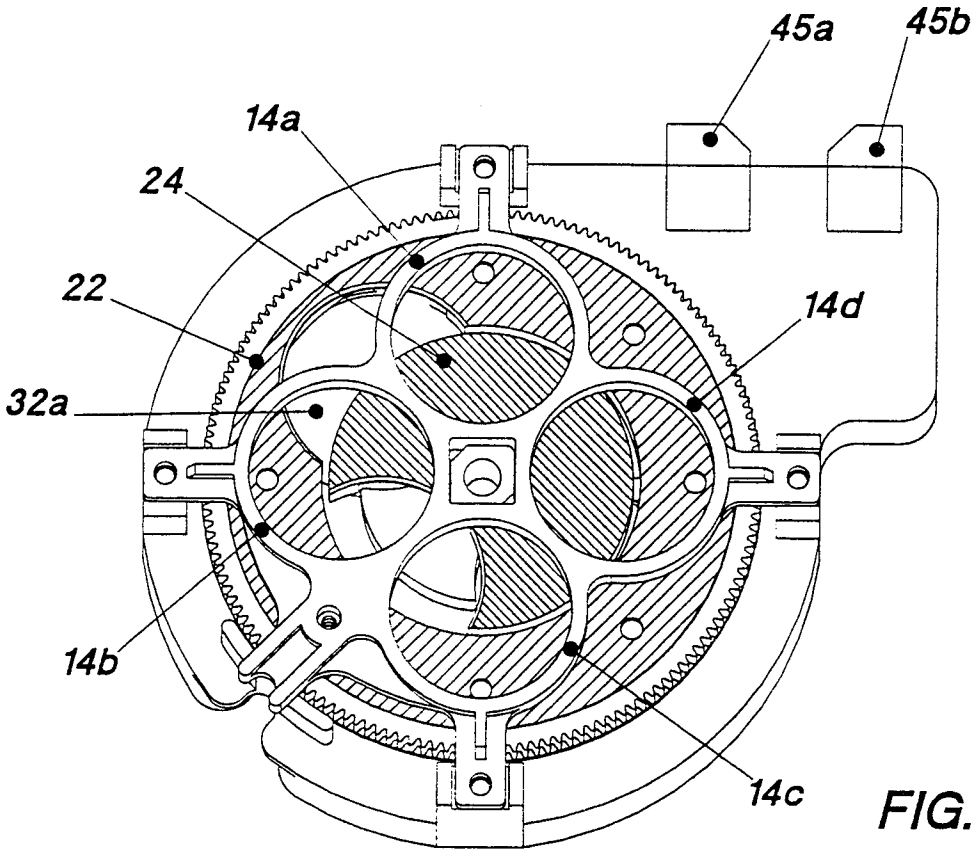


FIG. 9a

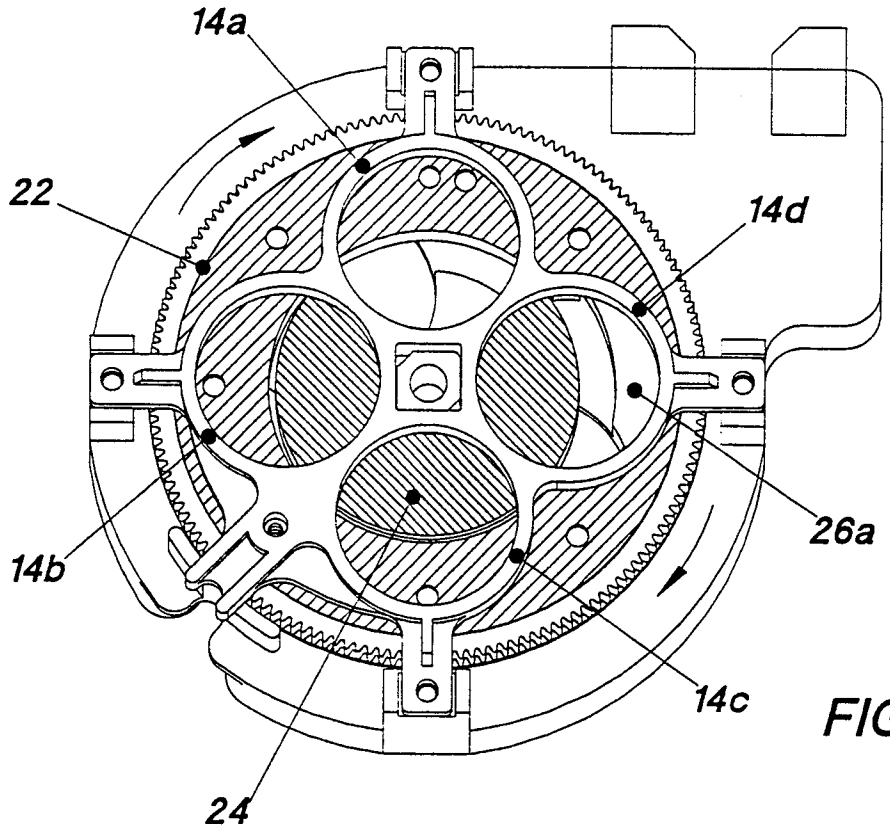


FIG. 9b

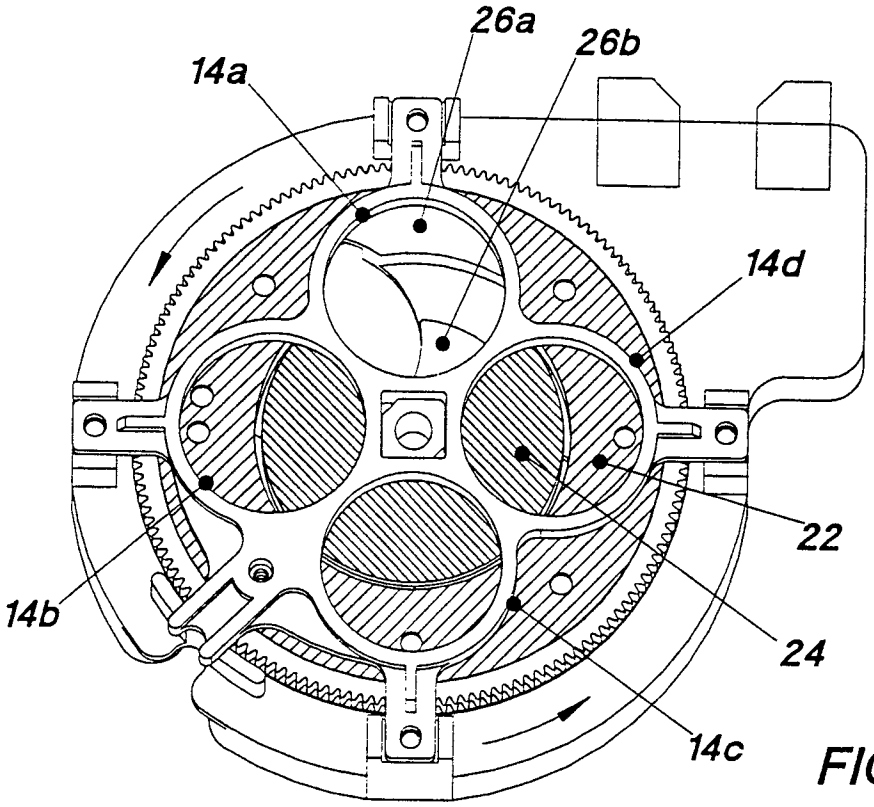


FIG. 9c

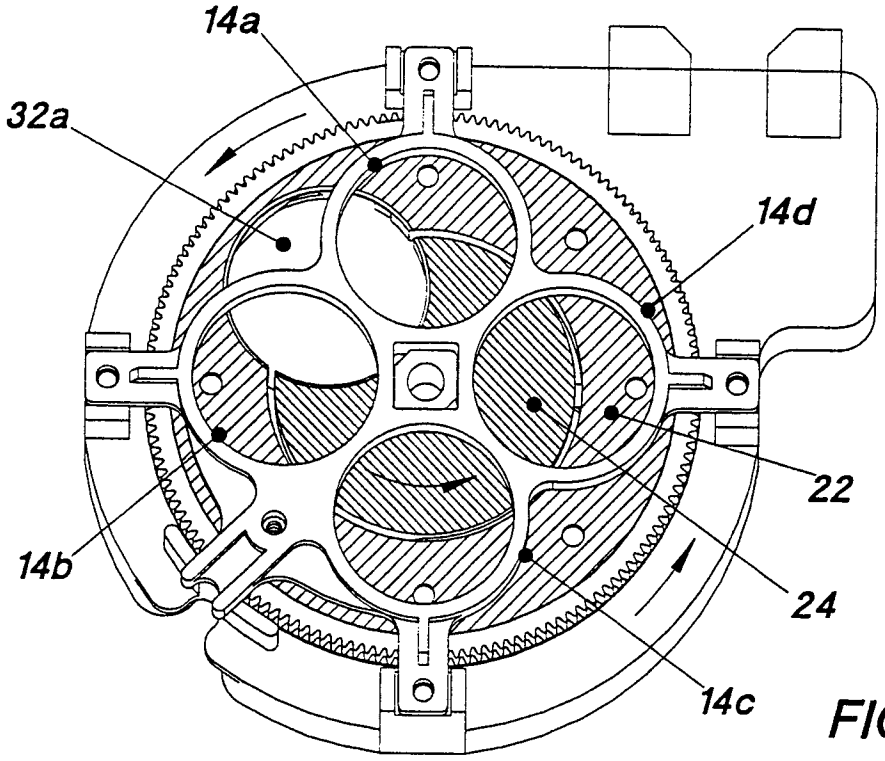


FIG. 9d

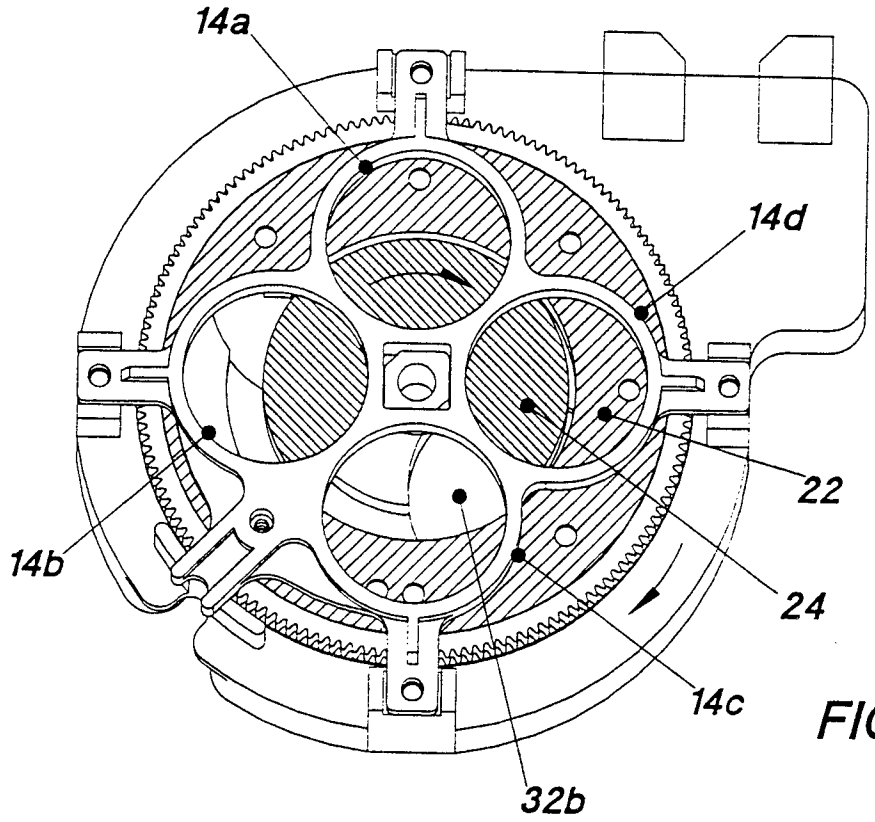


FIG. 9e

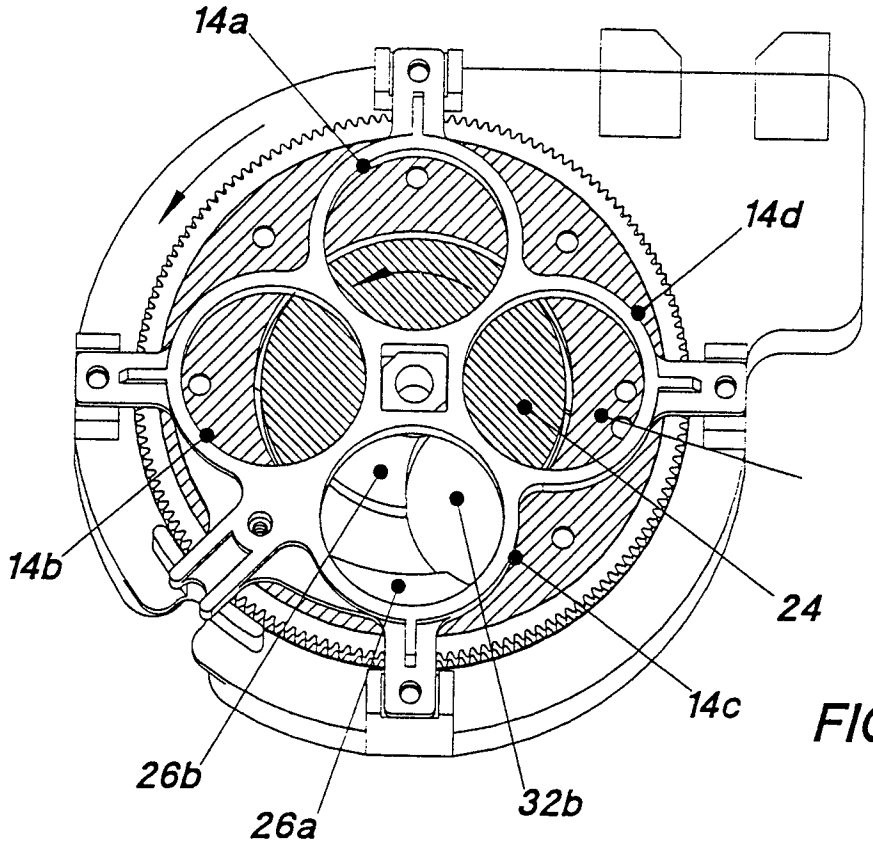


FIG. 9f

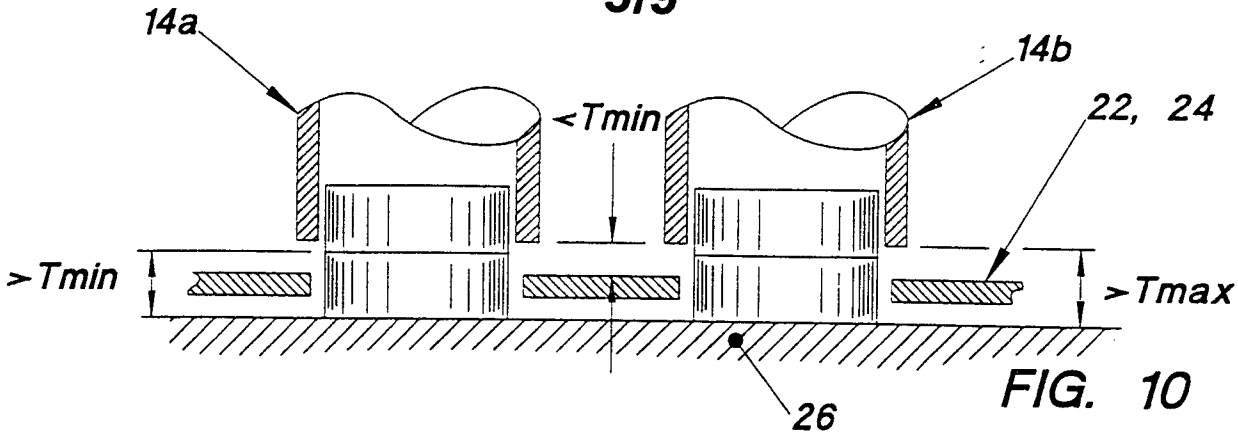


FIG. 10

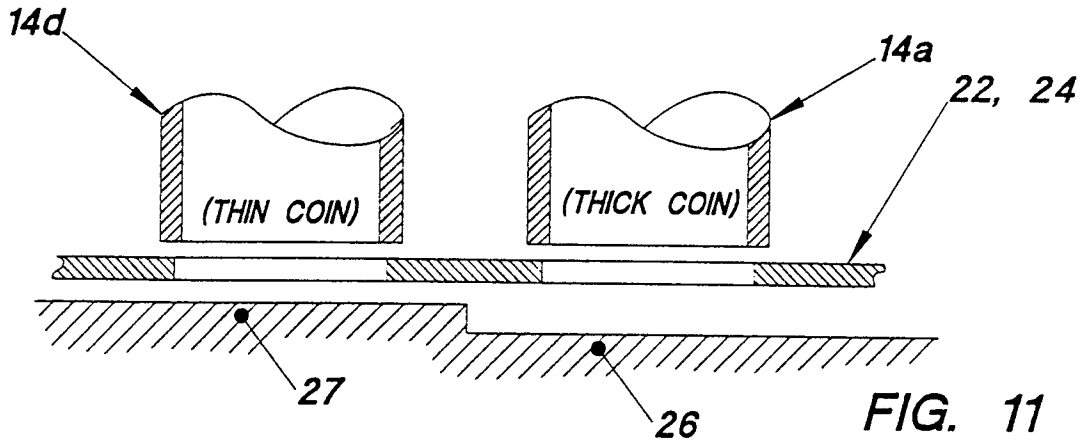


FIG. 11

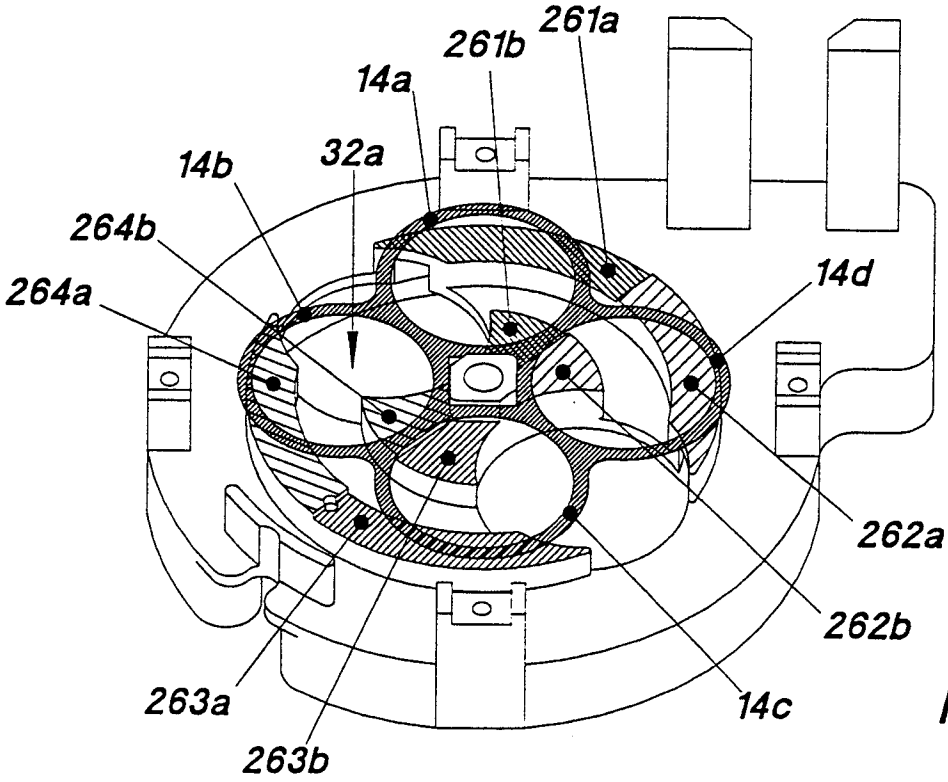


FIG. 12

INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 99/00805

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 G07D1/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 G07D G07F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 2 401 469 A (CASIO COMPUTER) 23 March 1979 (1979-03-23) claim 1; figures	12
A	DE 25 56 865 A (BERLINER MASCHINENBAU AG) 16 June 1977 (1977-06-16) page 18, line 5 - page 20, line 5; figures	1,5,6,8, 11
A	DE 27 22 803 A (LUESCHER) 8 December 1977 (1977-12-08) page 4, line 1 - line 21; figures	1,5,9,11
A	FR 2 609 341 A (COMPAGNIE GENERALE D'AUTOMATISME) 8 July 1988 (1988-07-08) page 8, line 5 - page 9, line 25; figures	1

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
28 July 1999	04/08/1999

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Neville, D

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

In ational Application No
PCT/GB 99/00805

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 2401469 A	23-03-1979	JP 54036798 A	17-03-1979
		DE 2837217 A	08-03-1979
		GB 2003308 A,B	07-03-1979
		US 4202362 A	13-05-1980
DE 2556865 A	16-06-1977	NONE	
DE 2722803 A	08-12-1977	CH 609476 A	28-02-1979
FR 2609341 A	08-07-1988	CA 1308076 A	29-09-1992
		DE 3876256 A	14-01-1993
		EP 0278216 A	17-08-1988
		JP 1742809 C	15-03-1993
		JP 4029115 B	18-05-1992
		JP 63175993 A	20-07-1988
		US 4836825 A	06-06-1989